

AMENDMENTS TO THE SPECIFICATION

Please replace the indicated paragraphs with the following replacement paragraphs, marked-up to show changes:

[0028] To the rotating shaft 22, a multi pole magnetized magnet 23 where 10 poles are magnetized is fixed, and near the rotation orbit of this multi pole magnetized magnet 23, two ~~[[hole]]~~Hall IC's 24 are arranged with a phase difference of 90 degrees to each other. These ~~[[hole]]~~Hall IC's 24 may output a pulse signal Ps at every change of magnetic field when the multi pole magnetized magnet 23 rotates, and when the rotating shaft 22 makes its one rotation, from the ~~[[hole]]~~Hall IC's 24, pulse signals Ps for 10 cycles where phases are displaced by 90 degrees are output. By the way, a ~~[[hole]]~~Hall IC is a sensor that converts a change of magnetic field into voltage.

[0034] To the side of the drum 36, a multi pole magnetized magnet 37 where 10 poles are magnetized is attached, and near the rotation orbit of this multi pole magnetized magnet 37, a ~~[[hole]]~~Hall IC 38 is arranged. This ~~[[hole]]~~Hall IC 38 may output a pulse signal at every change of magnetic field when the multi pole magnetized magnet 37 rotates, and when the drum 36 makes its one rotation, from the ~~[[hole]]~~Hall IC 38, pulse signals for 10 cycles are output.

[0036] The ECU 40 is equipped with a micro processor (hereinafter, referred to as CPU 41), and to this CPU 41, a ROM 43, a RAM 44, a timer 45 and an I/O port 46 are connected via a bus line 42. In the ROM 43, control programs, calculation equations and map data and the likes are stored, and the RAM 44 may temporarily store data processed by the CPU 41. Further, to the I/O port 46, the ~~[[hole]]~~Hall IC's 24 and 38, and a slide door open-close switch (hereinafter, referred to as open-close switch) not illustrated therein are connected, and pulse signals or command signals from these components are input via the I/O port 46 to the CPU 41.

[0037] The ECU 40 may detect rotation speeds of the electric motor 21, i.e., the move speed V_o in the opening direction of the slide door 3 and the move speed V_c in the closing direction thereof, according to the cycle T_p of pulse signals P_s input from the Hall IC 24, and detect the rotation direction of the electric motor 21, i.e., the move direction of the slide door 3 on the basis of the occurrence timing of these pulse signals. Further, the ECU 40 detects that the cycle T_p of the pulse signals P_s reaches a preset threshold value T_α or below, and thereby may judge whether the move speeds V_o and V_c of the slide door 3 reaches a preset specified speed, i.e., the move speed V_α or higher.

[0038] Further, the ECU 40 analyzes the rotation angle of the drum 36 by the pulse signals input from the Hall IC 38, and may detect the position of the slide door 3 on the basis of this rotation angle. This is made by that the multi pole magnetized magnet 37 is magnetized so as to generate a reference pulse signal for the ECU 40 to recognize the reference position of the slide door 3 at the Hall IC 38, and pulse signals are increased and decreased from the reference position of the slide door 3 based on this reference pulse. By the way, the reference position may be the fully opened position or the fully closed position of the slide door 3, or plural reference positions may be arranged too. Further, the ECU 40 may detect the lapsed time from a specified time point by the timer 45. By the way, the position of the slide door 3 may be detected not only by this Hall IC 38 but also by a resolver or a rotary encoder and the like.

[0040] To the I/O port 46, the electric motor 21 and the electromagnetic clutch 31 are further connected, and the CPU 41 calculates input signals from the Hall IC's 24 and 38 and the open-close switch according to the control program stored in the ROM 43, and thereby executes the driving control of the electric motor 21 and the switching control of the electromagnetic clutch 31.

[0048] First, the ECU 40 supplies current to the coil portion 34 of the electromagnetic clutch 31 and switches the electromagnetic clutch 31 to its connected status. Next, the ECU makes the electric motor 21 into its automatic open-close mode and rotate the electric motor in its normal rotation direction, i.e., its opening direction and rotates the drum 36 in its opening direction. Thereby, the vehicle rear side of the cable 14 is wound up by the drum 36, and the slide door 3 is pulled by the cable 14 and starts moving toward its fully opened position. At this moment, the ECU 40 starts the detection of the move direction and the move speed V_o of the slide door 3 by the pulse signal P_s from the Hall IC 24, and starts the detection of the position of the slide door 3 by the pulse signal from the Hall IC 38. Then, when the roller assy 7 goes over the checker 12 and the slide door 3 moves to its fully opened position, the current supply is cut off and the electric motor 21 is stopped, then, the electromagnetic clutch 31 is switched to its disconnected status.